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BSc Radiology, Diagnostic Imaging and Radiotherapy Techniques

INTEGRATED COURSE: General Hygiene, Radiological Instruments and Radiological Protection

SSD: MEDS-22/B (ex Med/44), MEDS-22/A (ex Med/36), IMIS-01/B (ex Ing-Inf/07)

RESPONSIBLE TEACHER: Lorenzo Ippoliti

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TOTAL CFU: 7

TEACHING: Workplace Safety

SSD: MEDS-22/B (ex Med/44)

PROFESSOR: Prof. Lorenzo Ippoliti

e-mail: lorenzo.ippoliti@unicamillus.org

CFU: 3

TEACHING: Radiological Protection

SSD: MEDS-22/A (ex Med/36)

PROFESSOR: Prof. Alessia Guarnera

e-mail: alessia.guarnera@unicamillus.org

CFU: 2

TEACHING: Electronics and Information Technology

SSD: IMIS-01/B (ex Ing-Inf/07)

PROFESSOR: Prof. Luca del Greco

e-mail: luca.delgreco@unicamillus.org

CFU: 2

PREREQUISITES

There are no mandatory prerequisites. Basic knowledge is required in the following subjects: medical physics, cell and general biology, medical genetics, physiology, biochemistry, microbiology, hygiene and environmental prevention, knowledge of the physical principles and of the radiological anatomy.

LEARNING OBJECTIVES

Student should acquire the knowledge of the regulatory framework for maintaining the health and safety (H&S) both at individual and community level in the occupational setting; knowledge of the legislation and practice for health promotion and the ability to recognize situations of specialistic pertinence. Knowledge of the norms regulating health organization and their applications in occupational medicine is also required. Furthermore, the course aims to educate students on the equipment used in Radiology, the physical and biological principles of radiation, radiobiology, radiation protection, and the legislative elements relating to the correct application of radiation in the radiological and radiotherapy fields. Teaching such applications is



crucial for the development of specific professional skills. Basic knowledge is also required to understand the essential role of computer networks and the main concepts of electrical systems and electrical safety.

LEARNING OUTCOMES

Knowledge and understanding

Meaning of Occupational Medicine. Temporal evolution. Legislative aspects. General and specific risks for workers. Methods for risk assessment. Health surveillance. Fitness and unfitness for work. Students should be able to understand the basilar principles of Occupational Medicine, how to perform risk assessment, and the steps of health surveillance. They should know the criteria of risk assessment and should be able to apply them. The students should also: know the machines and equipment used in Radiology, knowing the physical and biological principles of radiation, knowing the basics of Radiobiology and Radiation Protection, know the legislative basis for the correct application of radiation in the radiological and radiotherapy fields. What are computer networks, the Internet, and the Web, with particular attention to security and privacy issues; Knowledge of fundamental electrical quantities and units of measurement; Ohm's laws, resistance, and resistivity; electrical systems and circuits; electrical power and the Joule effect; distribution and use of electrical energy; principles of electrical safety.

Applying knowledge and understanding

At the end of the course, the student will be able to:

- Translating the acquired knowledge into the future occupational activities.

correctly apply radiations in radiology.

Communication skills

At the end of the course, the student will achieve:

- The proper use of the specific H&S and radiological protection scientific terminology.
- Apply his/her knowledge to guarantee adequate professional and communication skills in a professional setting
- How to appropriately use the terminology commonly referred to information systems, electrical quantities (voltage, current, power, frequency), electrical energy characteristics (voltage levels, network frequency) and electrotechnical devices (switches, cables and safety devices)

Making judgements

At the end of the course, the student will achieve:

- the ability to perform general assessments related to the topics covered.



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- knowledge and competency for an effective and safe use of network of computers and systems
- How to prevent and manage risks associated with system failures and hardware loss
- How to interpret electrical quantities and characteristics of electrical energy

COURSE SYLLABUS

WORKPLACE SAFETY

KEY CONCEPTS:

1. Occupational Risk
2. Occupational Disease
3. Accident at work
4. Health surveillance

Topic I. Historical evolution of Occupational Medicine (Castellino, Anzelmo, Castellani, Pofi. Breve storia della Medicina del lavoro in Italia. Pag 15-165)

Topic II Chemical risk in Occupational Medicine (Perbellini, Sartorelli, Satta, Cocco, Genovese, Monaco, Miraglia, Oddone, Taino, Imbriani, Colosio, Candura, Manzo. Parte Terza Agenti Chimici. In “Manuale di Medicina del Lavoro” a cura di Tomei, Candura, Sannolo, Sartorelli, Costa, Perbellini, Larese-Filon, Maestrelli, Magrini, Bartolucci, Ricci. Pag 165-245)

Topic III Risk related to physical agents (De Vito, Riva, Cassano, Tomei, Suppi, Albera, Pimpinella, Peretti, Pasqua di Bisceglie, Gambelunghe, Abbritti, Trenta, Gobba. Parte Seconda. Agenti Fisici. In “Manuale di Medicina del Lavoro” a cura di Tomei, Candura, Sannolo, Sartorelli, Costa, Perbellini, Larese-Filon, Maestrelli, Magrini, Bartolucci, Ricci. Pag 109-161)

Topic IV. Biological risk (Porru, Arici, Rosati, Giubilati, Suppi, Fidanza, Ricci, Nardone, Tomei. Parte Quarta. Agenti Biologici. In “Manuale di Medicina del Lavoro” a cura di Tomei, Candura, Sannolo, Sartorelli, Costa, Perbellini, Larese-Filon, Maestrelli, Magrini, Bartolucci, Ricci. Pag 249-269)

Topic V. Alcohol and drug abuse at work (Bordini, Briatico-Vangosa. Parte Quinta. Alcol e droghe sul luogo di lavoro. In “Manuale di Medicina del Lavoro” a cura di Tomei, Candura, Sannolo, Sartorelli, Costa, Perbellini, Larese-Filon, Maestrelli, Magrini, Bartolucci, Ricci. Pag 347-352)

RADIOLOGICAL PROTECTION

- **Radiation**
Physical principles of ionizing and non-ionizing radiation, natural and artificial sources, main quantities and units of measurement.
- **Introduction to Radiology**
Physical principles, Equipment and Radiological Techniques: X-ray, CT, BMD, mammography; brief overview of ultrasound and MRI.
- **Introduction to Nuclear Medicine**
Physical principles, Equipment, Radiopharmaceuticals and Nuclear Medicine Techniques (scintigraphy, SPECT, PET, PET/CT).
- **Introduction to Radiotherapy**
Physical principles, Equipment and Radiotherapy Techniques (teletherapy and brachytherapy), essential concepts of dose and fractionation, brief notes on side effects and isodose curves.
- **Radiobiology**
Radiobiological Principles and Effects of Radiation, Deterministic and Stochastic effects.
- **Radiation Protection**
Principles of justification, optimization (ALARA) and dose limitation; radiation protection of patients, exposed workers and the public.
- **Quality Management**
Principles of Quality Assurance and Quality Control in Radiology, Nuclear Medicine and Radiotherapy.
- **Seminar on Legislative Decree 101/2020**
Legislative Decree 101/2020: Focus on the Radiological Implications.

ELECTRONICS AND INFORMATION TECHNOLOGY

- Introduction to computer networks
- Topology, architecture, and size of computer networks
- Electrical quantities and units (current, voltage, power)
- Ohm's laws, resistance, and resistivity
- Electrical systems and circuits (nodes, meshes, and Kirchoff's laws, resistances in series and parallel)
- Electrical power and the Joule effect



- Use of electrical energy (alternating and direct current, voltage levels, and application examples)
- Protection of people from electrical hazards

COURSE STRUCTURE

The Course is structured in 70 hours of frontal teaching (30 for Occupational Medicine, 20 for Radiological Protection, and 20 for Electronics and Information Technology.. Tools such as power point presentation, diagrams, movies and animations will be used in support of the explanation of the single topics. An in depth seminar of 3 hour duration will be delivered for each module. A 3 hour specific seminar of Occupational Medicine will be devoted to the following topic “New risk factors in occupational medicine: nanomaterials, microplastics and nanoplastics”, the seminar of Radiological Protection will be on “Law 101/2020: Focus on the Radiological Implications”

COURSE GRADE DETERMINATION

The Course grade determination will be assessed through a multiple choice written test aimed to verify the student's ability to make judgments, communication skills and learning skills according to the Dublin descriptors. The test will include 30 questions, each of which will attribute 1 point in the case of a correct answer, and will last 30 min. No penalty will be given in the case of wrong answers. The minimum threshold for considering the test as successful is a mark of 18. The test will be evaluated according to the following criteria:

Failed: Relevant weaknesses and/or inaccuracies in knowledge and understanding of the topics. Limited analytical and synthetic capabilities.

18-20: Sufficient knowledge and understanding, with possible inaccuracies. Sufficient analytical and synthetic capabilities, and proper personal judgment.

21-23 Average knowledge and understanding. More than sufficient analytical and synthetic capabilities.

24-26 Knowledge and understanding in the upper 50%. Good analytical and synthetic capabilities.

27-29 Extensive knowledge and understanding of the topics. Relevant analytical and syntetic capabilities. Good proper personal judgment.

30-30L Impressive knowledge and understanding of the topics. Very good analytical and synthetic capabilities, and proper personal judgment.

During the teaching course a test aimed to verify possible deficit in understanding will be administered. This intermediate test will not impact on the evaluation of the exam test.

Students achieving a mark of at least 18 points will be offered the possibility to perform an integrative oral exam, aimed to a further in depth evaluation of the knowledge and understanding of the various topics, of their analytical and synthetic capabilities and of their personal judgment. A relevant portion of the oral



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exam will be devoted to evaluate their communication ability. At the end of the oral exam, the mark achieved with the written test may be maintained, or increased, or decreased. A final evaluation of failure in passing the exam will be also possible.

OPTIONAL ACTIVITIES

In addition to classes, there will be provided the opportunity to learn in seminars and monographic courses. The topics of the activities will not be a subject of examination.

READING MATERIALS

“Manuale di Medicina del Lavoro” a cura di Tomei, Candura, Sannolo, Sartorelli, Costa, Perbellini, Larese-Filon, Maestrelli, Magrini, Bartolucci, Ricci. Pag 1-526

“Medicina del Lavoro. Manuale per le professioni sanitarie” Sacco, Ciavarella, De Lorenzo. Pag 1-195

Teaching materials provided by teachers